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High School and College Physics— Can We Match Impedances?

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Enrollments in high school and college physics have been declining in a serious fashion over the past few years. As a result, it is estimated that probably less than 10 per cent of the present national population has any experience in physics. A relatively recent survey carried out for the American Institute of Physics indicates that the unwillingness of students to take physics in high school stems from a number of reasons, including: the belief that physics is too hard and too mathematical; physics is not for girls; and taking physics may lead to a lower grade which will adversely affect the obtaining of financial aid which most students are in need of in order to attend college. PSSC physics does not seem to have reversed the trend in enrollments. Two new high school courses—Project Physics and ECCP, both less formal and considered more appropriate to the nonspecialist—may help slow down and even reverse this trend.

Since the body of knowledge comprising physics continues to grow, there is constant concern among writers of high school textbooks about being up to date and among high school teachers in trying to insure that physics students will not enter college with a "knowledge gap." This tends to produce an unmanageable pace in an attempt to give complete coverage in one year and leads to a potentially dangerous "name dropping" acquaintance with a multitude of ideas in physics but only a limited understanding of the principles which undergird physics. These questions of pace and coverage are of fundamental importance and concern. It is suggested that the high school teacher severely restrict the course coverage but insure that what is taught is learned with full understanding by the student.

The college and university teacher of physics should not tell the high school teacher specifically what he should teach. It is the former's job to build on what the student brings to college. What he should bring is not so much detailed knowledge but rather certain attitudes and insights, including: an understanding of basic principles, the ability to reason quantitatively, the ability to analyze problems and produce logical solutions, the ability to read with understanding and to be able to use good English, an inquiring attitude, an eagerness to learn, and an awareness of the delicate interplay of theory and experiment in the development of physics.

At the college and university level there appear to be two major responsibilities: a willingness to assign the best and most experienced teachers to the introductory courses and a deliberate and conscientious attempt to produce more and better high school teachers of physics. The student's first experience with physics at the college level all too often is one which involves extensive use of the calculus. As a result, physics becomes lost in elegant mathematical manipulations and too many students are driven away from physics because they equate physics with very demanding mathematics.

The high school and college teachers have many problems and can greatly help each other. Much must be done to destroy the traditional image of the college teacher as an ivory-tower individual totally unaware of the practical realities of the high school and of the high school teacher as being so immersed in pedagogy and how to teach that he has never learned what to teach. To this end, several recommendations are made, including: exchange of visits, a conscientious and deliberate effort to improve the preparation of high school teachers by local short-term workshops and seminars, conferences on common problems, and a willingness by the college teacher to welcome and respond to requests for help from his high school counterpart. Above all, there must be a mutual respect in which the high school and college teacher regard each other as professional partners in a continually educational process.

Statement by the NSTA President

Few people would doubt that advancements in science and technology have dominated the changes in this century, and likewise, few would doubt the need to equip the citizenry with an understanding of these changes. To achieve this understanding of science has always been a serious and exciting undertaking. It is, however, one that must be continued and extended beyond formal education if we are to cope with the more complex scientific and technological changes of the future.

As President of the National Science Teachers Association, I urge every science teacher to accept responsibility for adult education in science. Science cannot be put on a shelf and reserved for the use of scientists and science students. Scientific information must be carried beyond the classroom into the community, and our scientific studies must be expanded to include all teachers of all disciplines, and every citizen in every area.

Learning, however, is a mutual effort, and the responsibility for producing knowledgeable citizens rests ultimately with the citizens themselves. The effort of teachers who accept the responsibility for educating the public must be matched by citizens who want to be educated, who want to learn. The only prerequisite is an interest in learning about the possibilities—and risks—of the scientific developments that are transforming man's environment.

Scientific research produces daily modifications in human welfare, and the future promises to surpass every present expectation. Gaining the intellectual tools needed to understand this increasing complexity is the only logical step toward making sound decisions about the application of the experimental results.

Elizabeth A. Simendinger
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